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(12) **United States Patent**
Dyson et al.

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(45) **Date of Patent: Aug. 16, 2016**

(54) **CLEANING APPLIANCE**

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(73) Assignee: **Dyson Technology Limited**, Malmesbury, Wiltshire (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 36 days.

(21) Appl. No.: **13/248,810**

(22) Filed: **Sep. 29, 2011**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

A47L 9/00 (2006.01)
A47L 5/36 (2006.01)
A47L 9/12 (2006.01)
A47L 9/16 (2006.01)

(52) **U.S. Cl.**

CPC ***A47L 5/362*** (2013.01); ***A47L 9/009*** (2013.01); ***A47L 9/127*** (2013.01); ***A47L 9/1633*** (2013.01)

(58) **Field of Classification Search**

CPC A47L 5/362; A47L 9/127; A47L 9/009
USPC 15/327.1, 327.6, 327.7, 353
See application file for complete search history.

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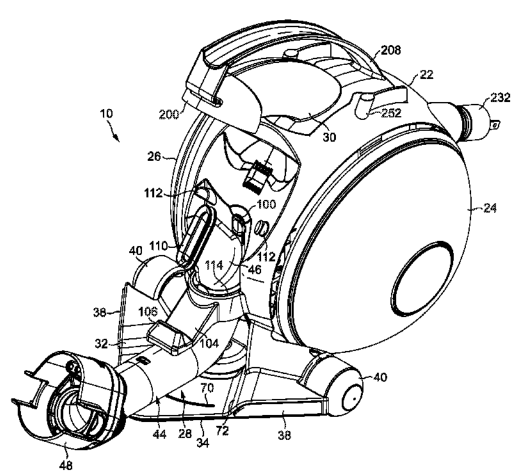
Primary Examiner — Michael Jennings
(74) *Attorney, Agent, or Firm* — Morrison & Foerster LLP

(57) **ABSTRACT**

A cleaning appliance includes cyclonic separating apparatus for separating dirt from a dirt-bearing fluid flow. The separating apparatus is mounted on a main body which includes a fluid inlet for receiving a fluid flow from the separating apparatus, a system for drawing the fluid flow into the rolling assembly, and a plurality of rolling elements rotatable relative to the main body and which define with the main body a substantially spherical floor engaging rolling assembly. The main body includes a support, which is separate from the fluid inlet, for supporting the separating apparatus.

21 Claims, 11 Drawing Sheets



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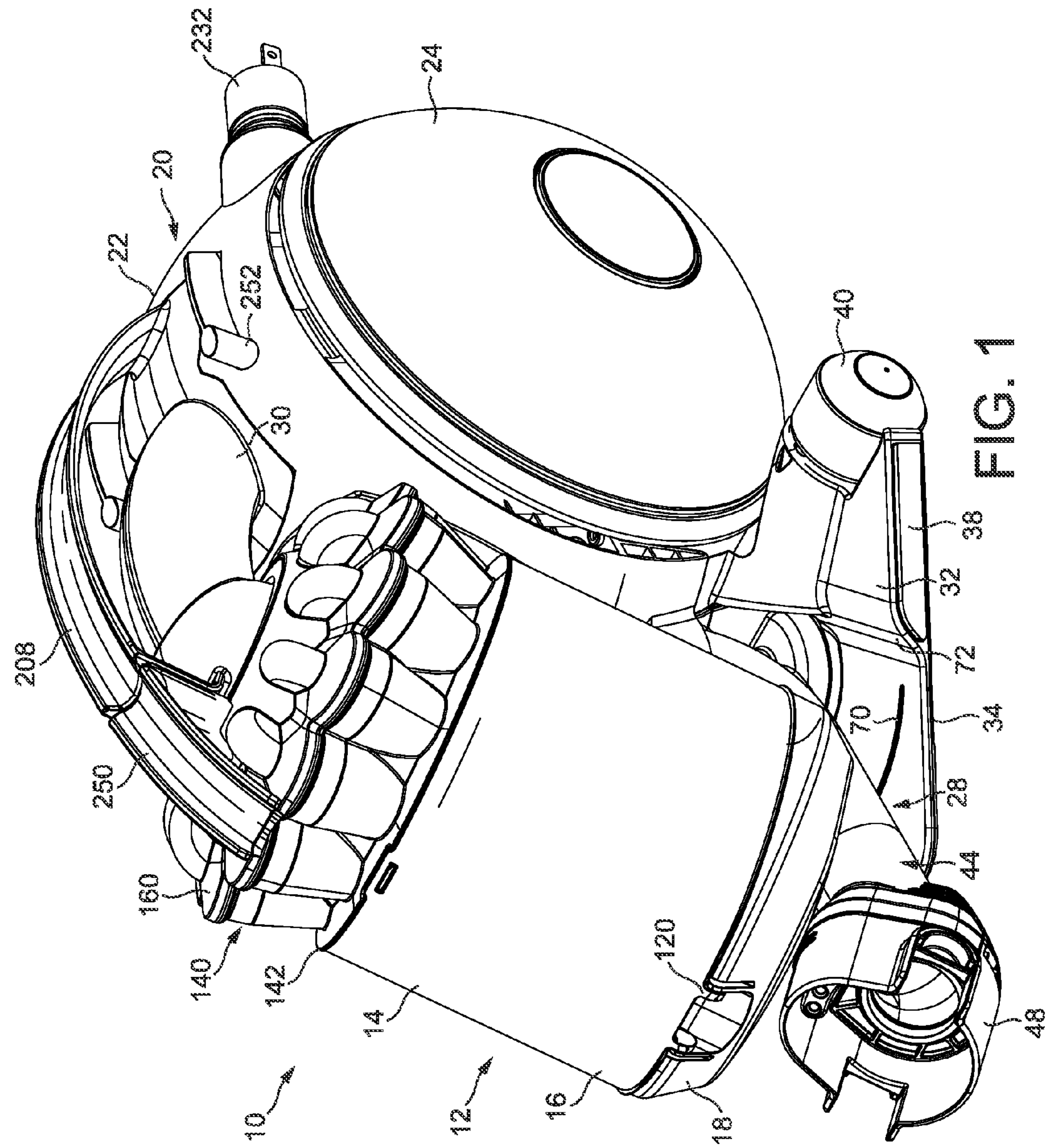
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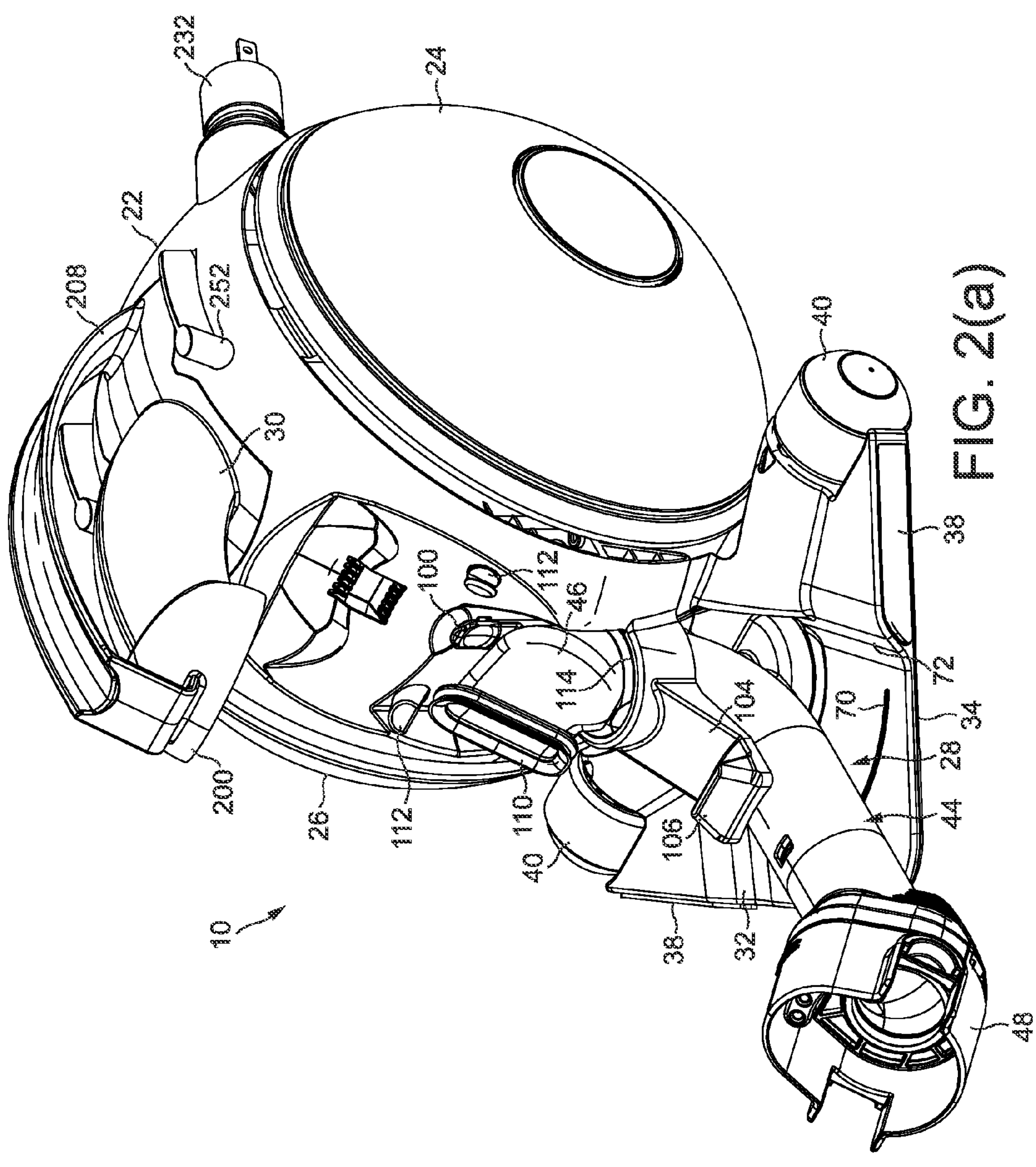

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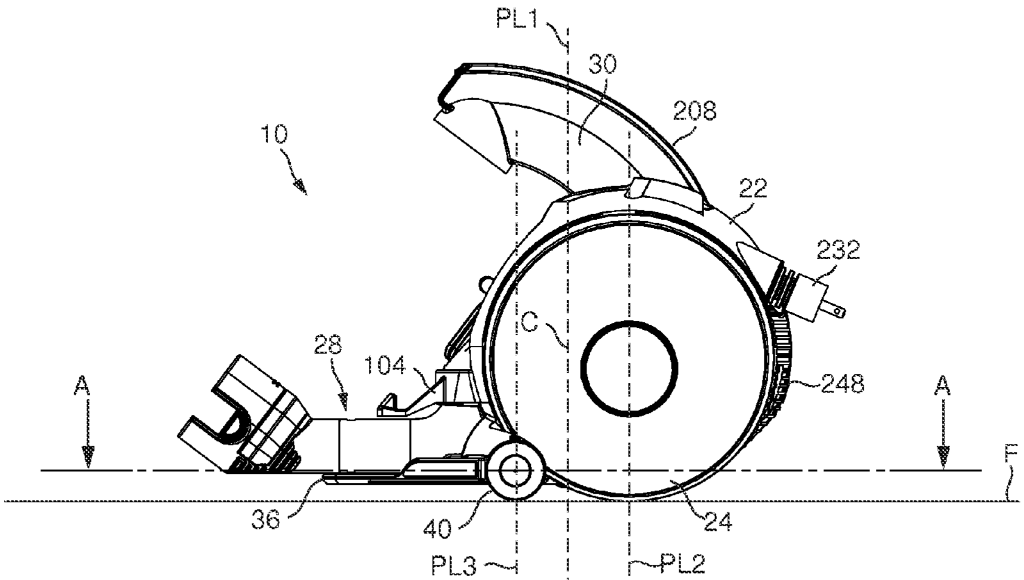
FIG. 2(a)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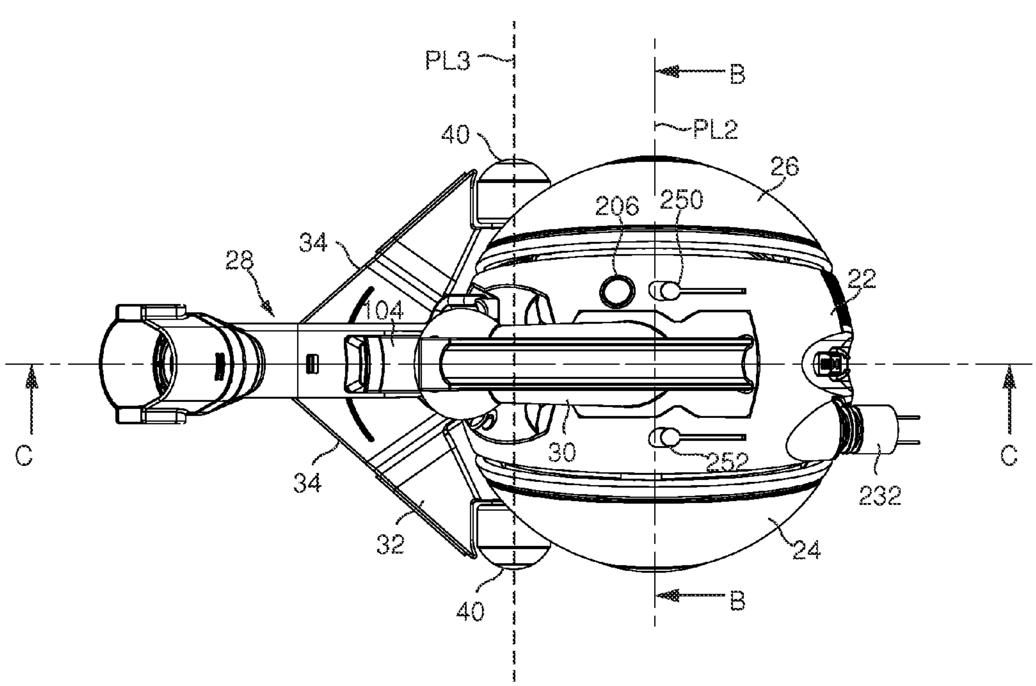
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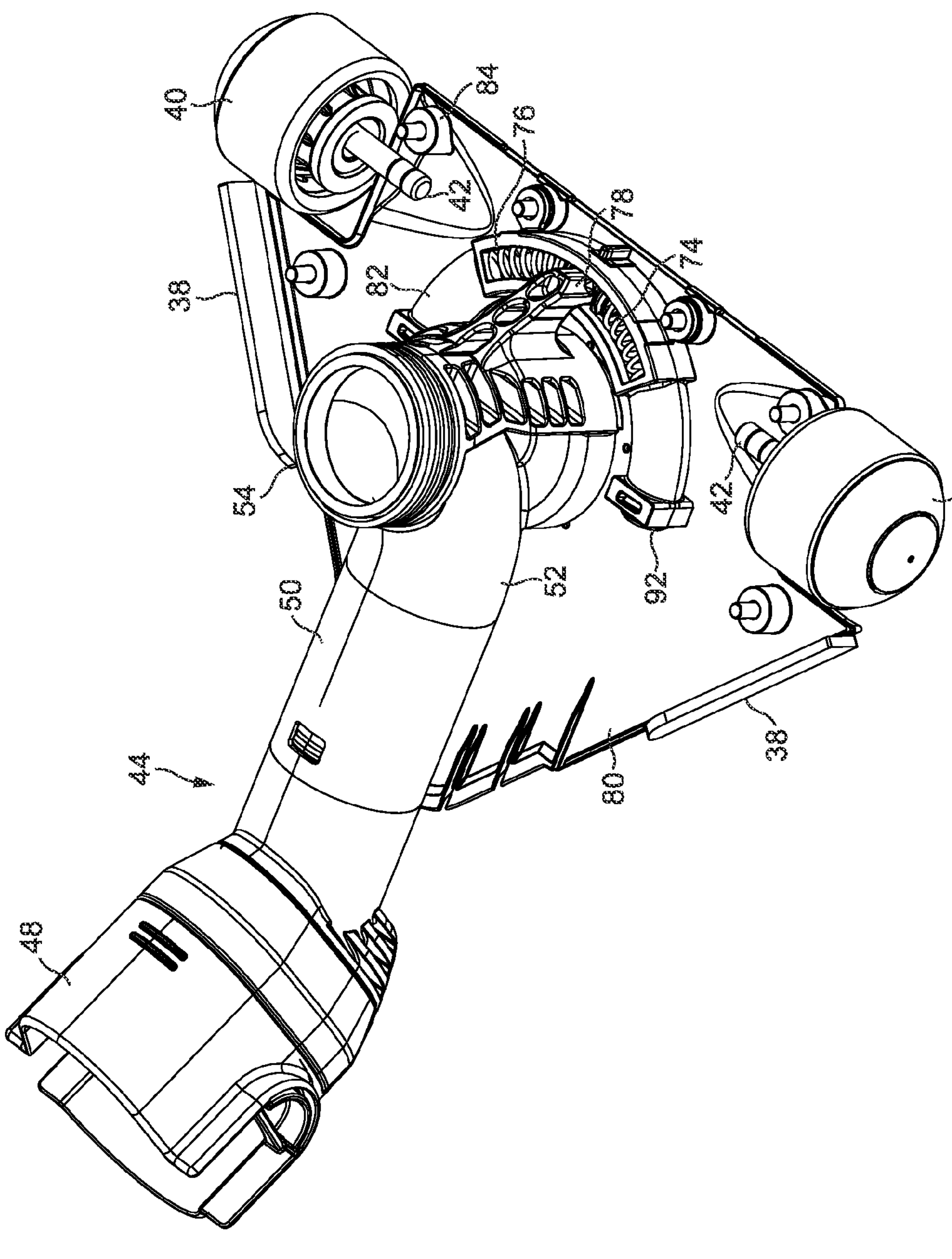

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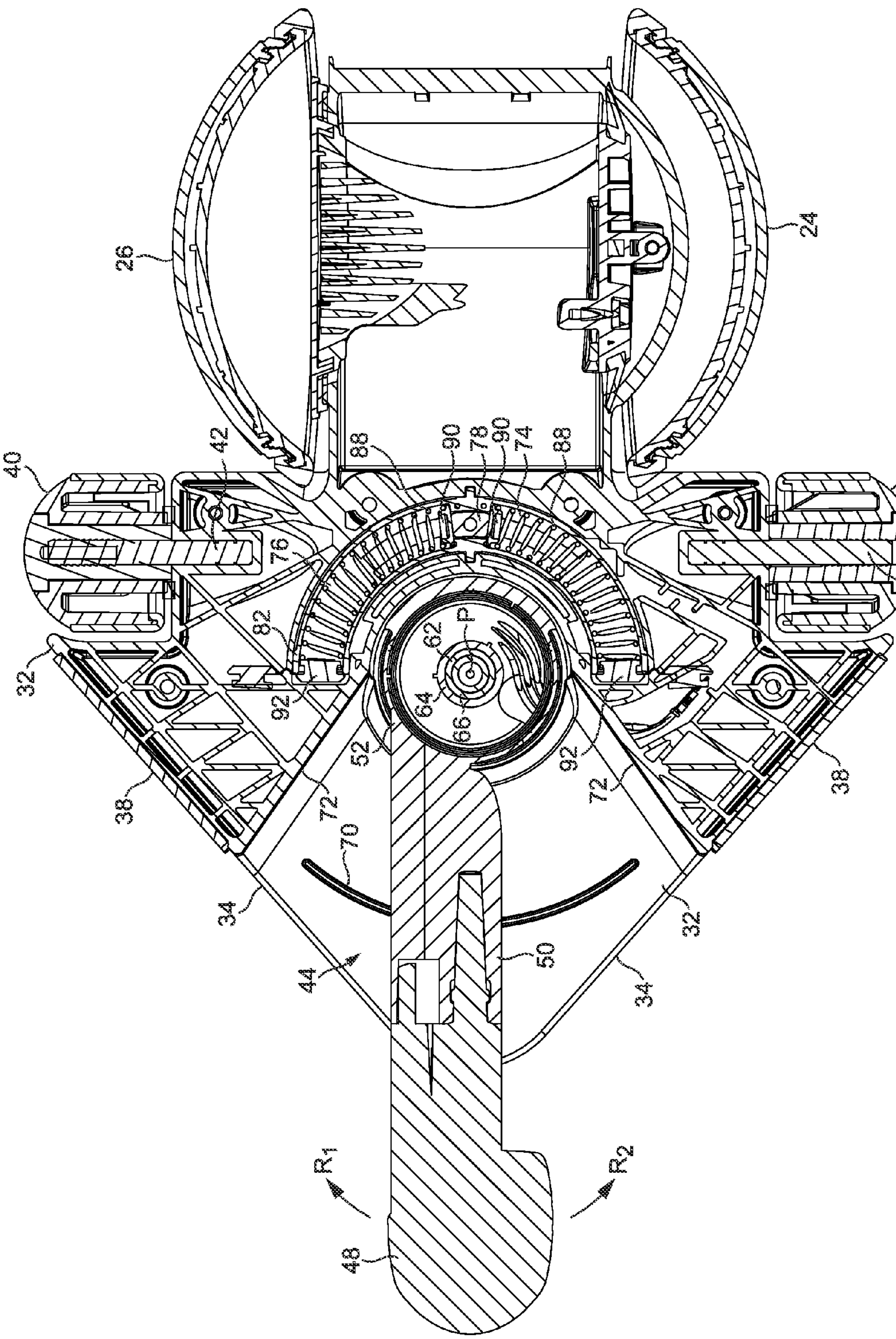
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FIG. 4

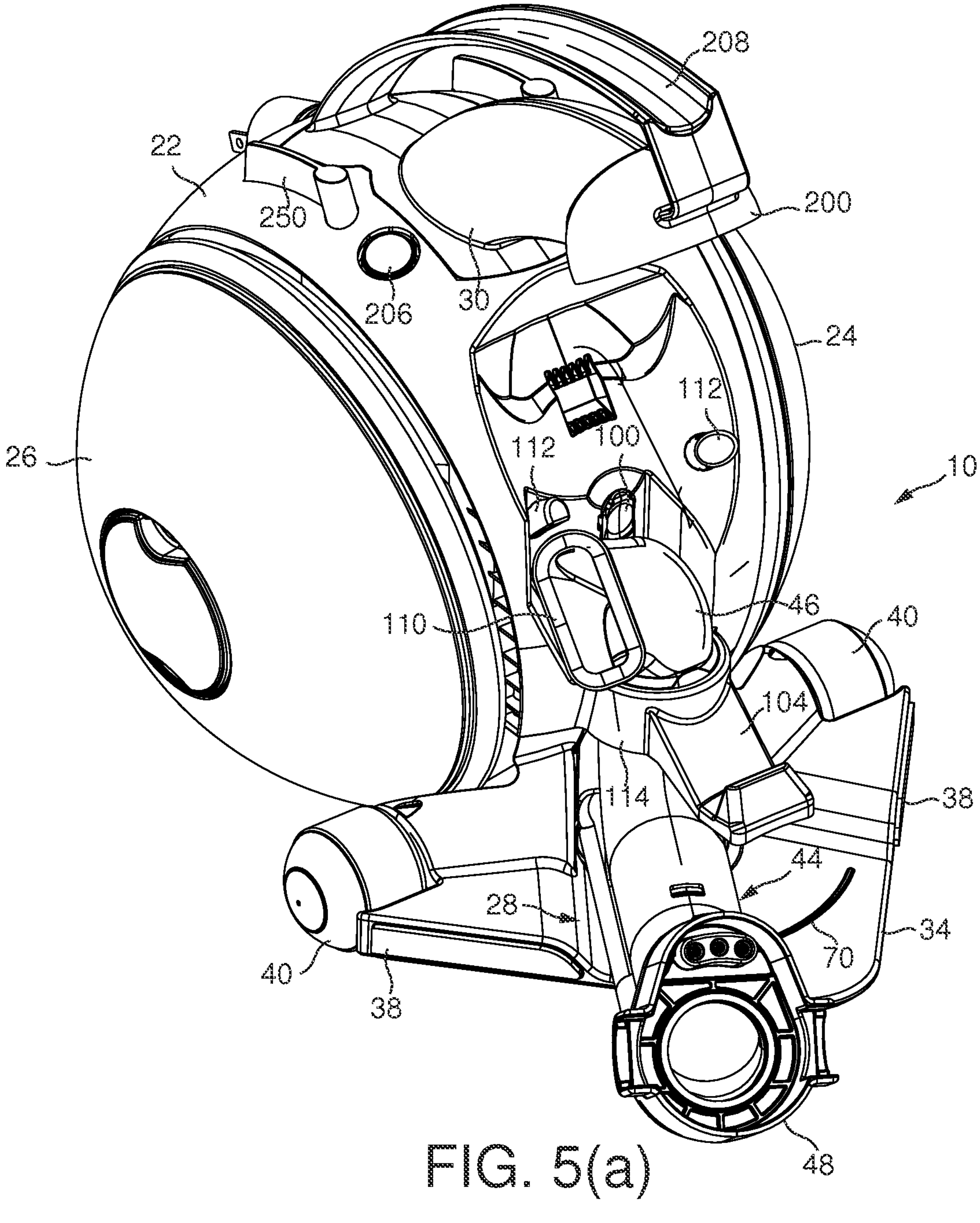
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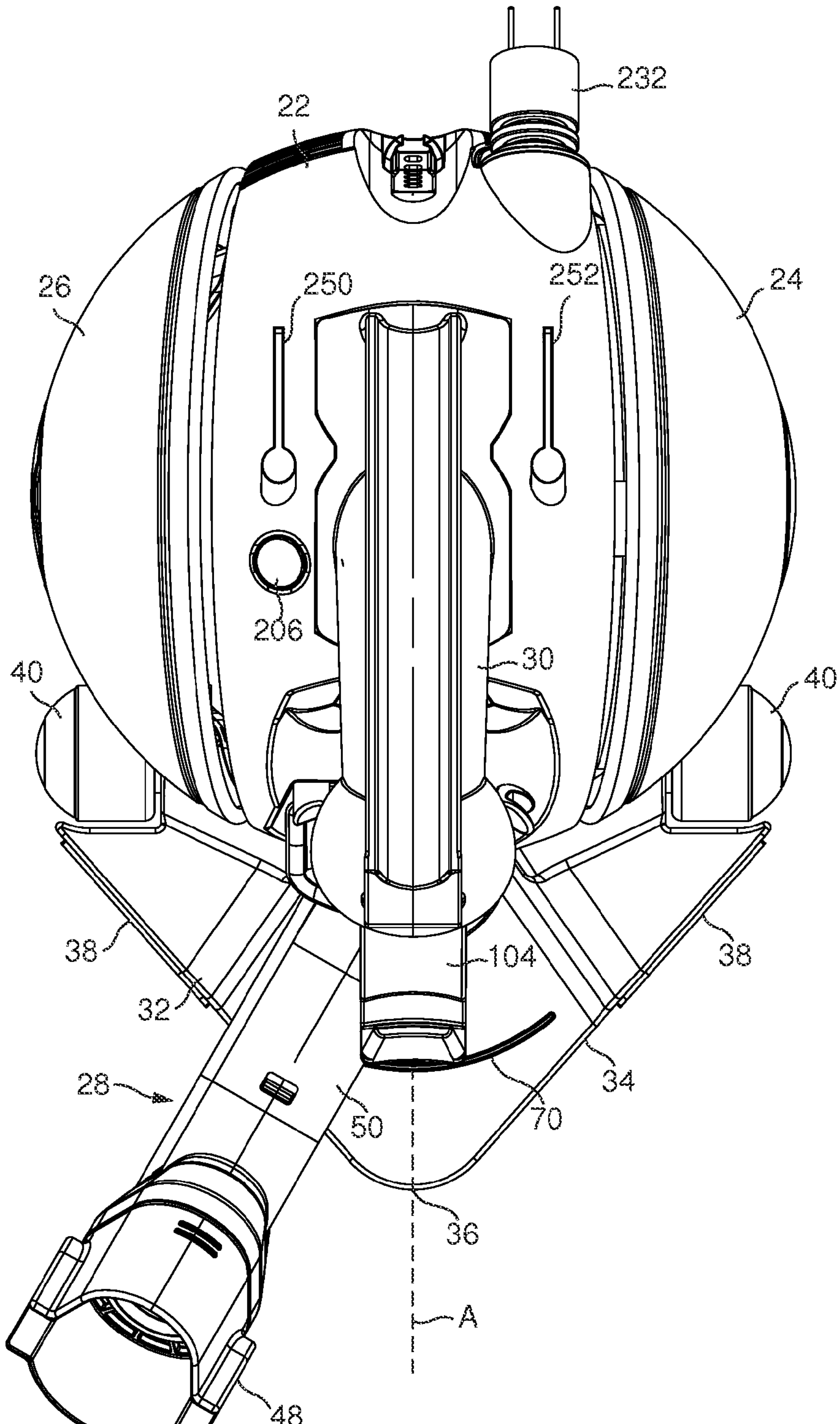
FIG. 5(a)



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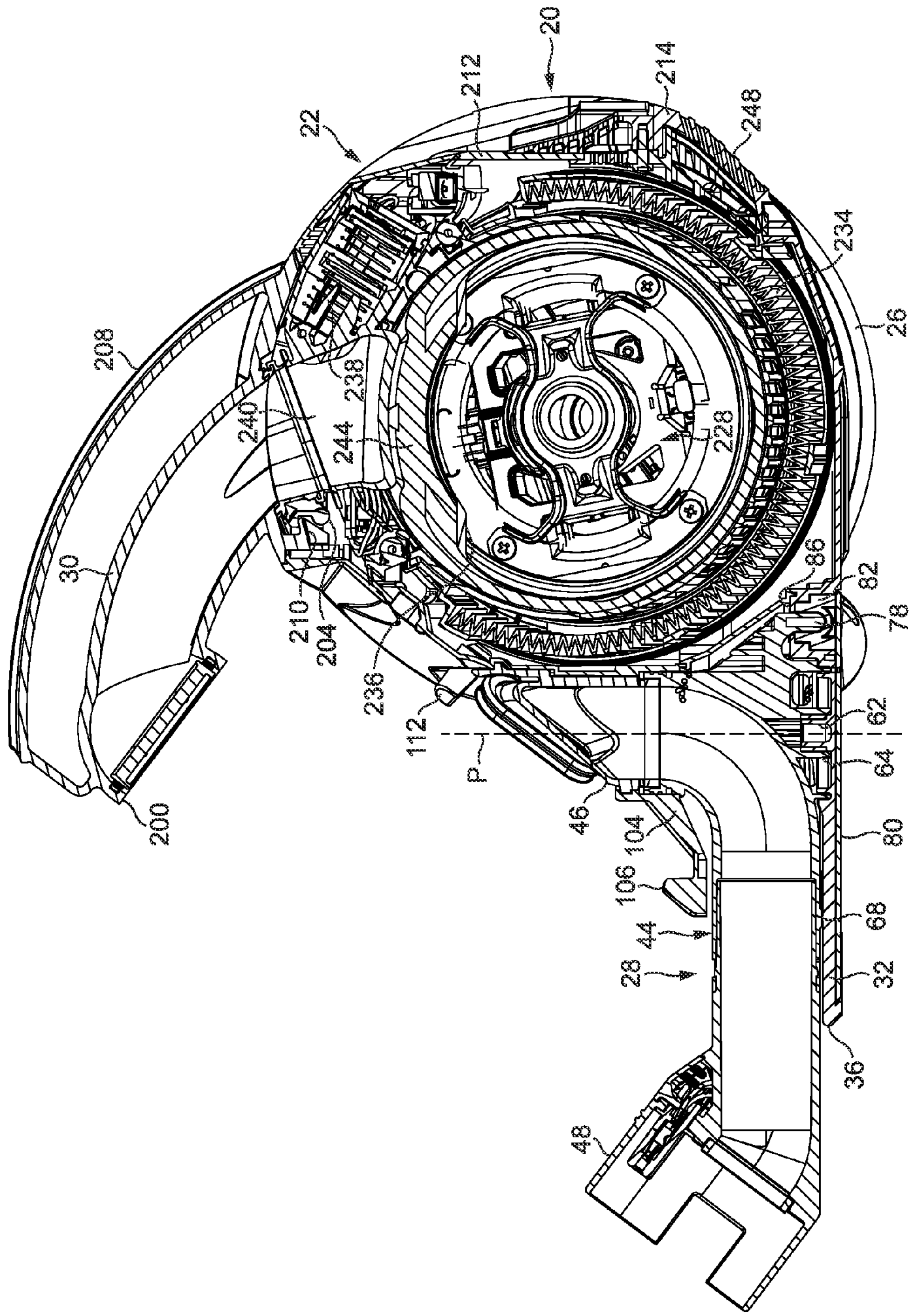
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FIG. 6(a)

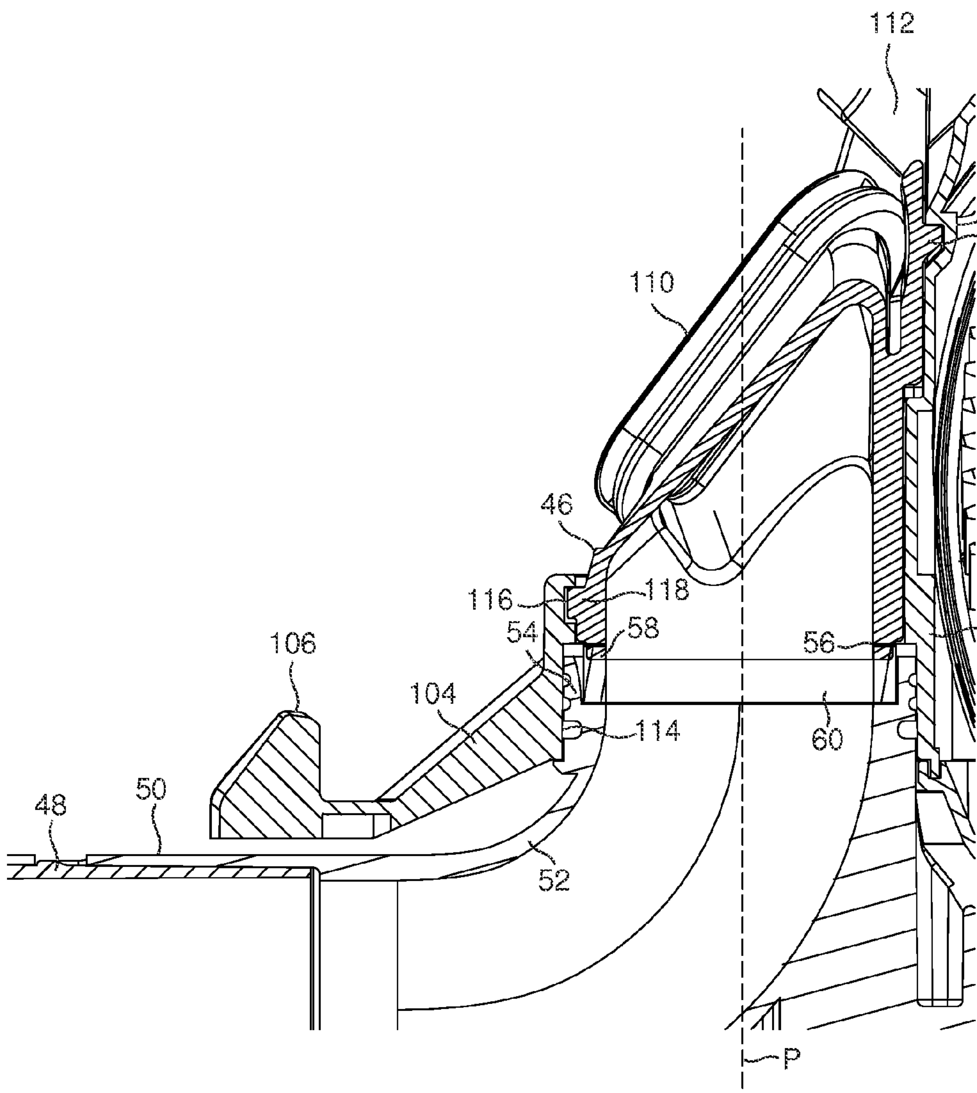
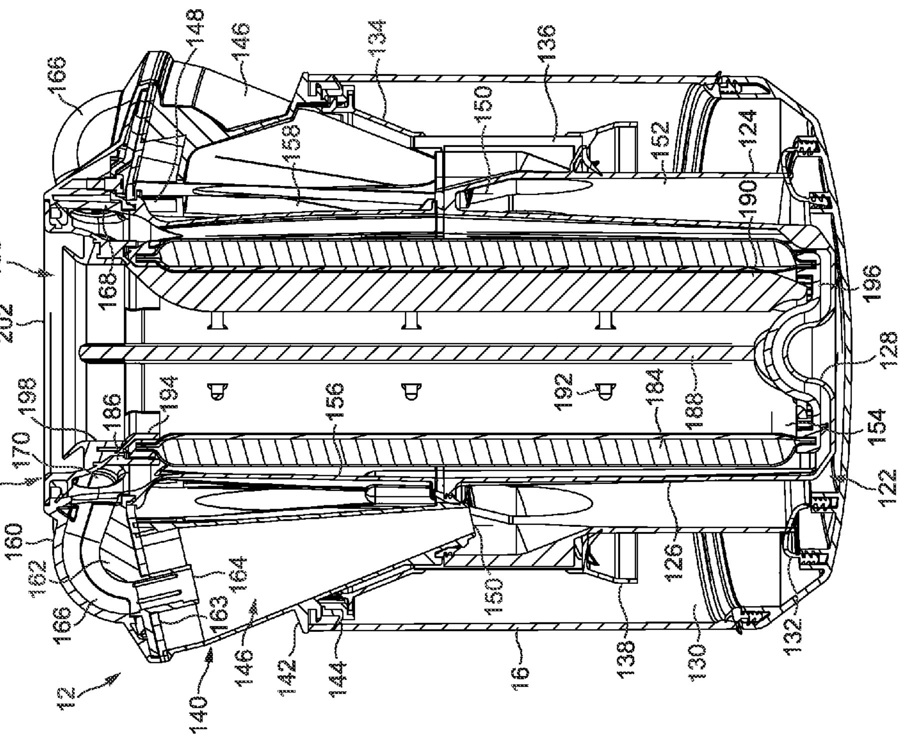


FIG. 6(b)

FIG. 7(b)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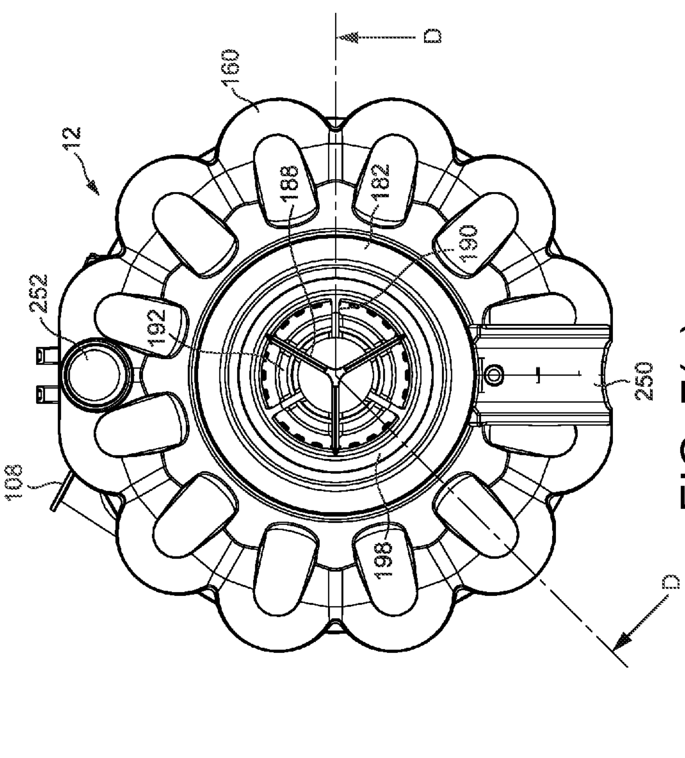
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FIG. 7(a)

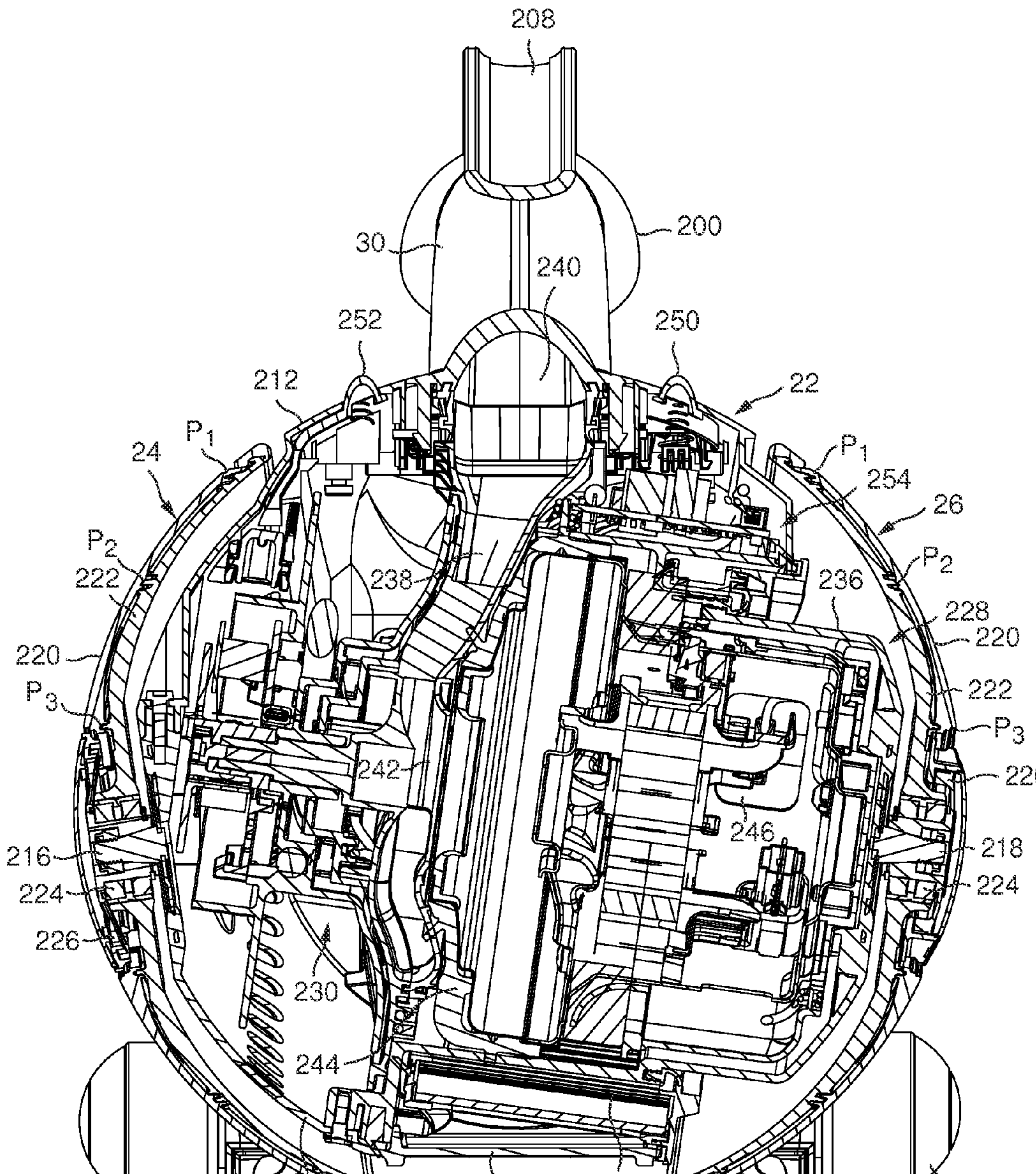
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FIG. 8

CLEANING APPLIANCE

REFERENCE TO RELATED APPLICATIONS

This application claims the priority of United Kingdom Application No. 1016449.9, dated Sep. 30, 2010, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a cleaning appliance, which in one embodiment is in the form of a vacuum cleaning appliance.

BACKGROUND OF THE INVENTION

Cleaning appliances such as vacuum cleaners are well known. The majority of vacuum cleaners are either of the "upright" type or of the "cylinder" type (called canister or barrel machines in some countries). Cylinder vacuum cleaners generally comprise a main body which contains a motor-driven fan unit for drawing a dirt-bearing air flow into the vacuum cleaner, and separating apparatus, such as a cyclonic separator or a bag, for separating dirt and dust from the air flow. The dirt-bearing air flow is introduced to the main body through a suction hose and wand assembly which is connected to the main body. The main body of the vacuum cleaner is dragged along by the hose as a user moves around a room. A cleaning tool is attached to the remote end of the hose and wand assembly.

For example, GB 2,407,022 describes a cylinder vacuum cleaner having a chassis which supports cyclonic separating apparatus. The vacuum cleaner has two main wheels, one on each side of a rear portion of the chassis, and a castor wheel located beneath the front portion of the chassis which allow the vacuum cleaner to be dragged across a surface. Such a castor wheel tends be mounted on a circular support which is, in turn, rotatably mounted on the chassis to allow the castor wheel to swivel in response to a change in the direction in which the vacuum cleaner is dragged over the surface.

EP 1,129,657 describes a cylinder vacuum cleaner which is in the form of a spherical body connected to the suction hose and wand assembly. The spherical volume of the spherical body incorporates a pair of wheels, one located on each side of the body, and houses an electric blower for drawing a fluid flow through the cleaner, and a dust bag for separating dirt and dust from the fluid flow.

PCT/GB2010/050418 describes a cylinder vacuum cleaner having a generally spherical rolling assembly connected to the chassis for improving the maneuverability of the vacuum cleaner over a floor surface. The rolling assembly comprises a body and a pair of dome shaped wheels connected to the body. The chassis extends forwardly from the body of the rolling assembly, and includes a pair of wheels for steering the vacuum cleaner and for supporting the rolling assembly as the vacuum cleaner is maneuvered over a floor surface.

The chassis also includes a support for supporting cyclonic separating apparatus of the vacuum cleaner. The support is located on an inlet duct for conveying a dirt-bearing air flow to the separating apparatus. To assist with the maneuvering of the vacuum cleaner around objects located on the floor surface, the inlet duct is pivotably connected to the chassis for movement relative to the chassis as the user pulls the vacuum cleaner in different directions over the floor surface. The movement of the duct relative to the chassis actuates a steering mechanism for turning the wheels connected to the chassis. The inlet duct comprises a relatively rigid section connected to the chassis for pivoting movement relative thereto, and a relatively flexible hose located upstream to the rigid section and which tends to flex relative to the rigid section as the duct pivots relative to the chassis.

SUMMARY OF THE INVENTION

In a first aspect the present invention provides a cleaning appliance of the canister type comprising a cyclonic separating apparatus for separating dirt from a dirt-bearing fluid flow, and a main body comprising a fluid inlet for receiving a fluid flow from the separating apparatus, a system for drawing the fluid flow into the rolling assembly, and a plurality of rolling elements rotatable relative to the main body and which define with the main body a substantially spherical floor engaging rolling assembly, wherein the separating apparatus is mounted on the main body.

By mounting the separating apparatus directly on to the main body of the spherical rolling assembly, which term includes a spheroidal rolling assembly, as opposed to mounting the separating apparatus on a support connected to an inlet duct for conveying the fluid flow to the separating apparatus, the overall length of the cleaning appliance may be reduced.

The main body preferably comprises a support for supporting the separating apparatus. The support is preferably integral with the main body of the rolling assembly. The main body may be formed from a plurality of sections, in which case the support is preferably integral with one of those sections.

The support is preferably separate from the fluid inlet of the main body, and so in a second aspect the present invention provides a cleaning appliance comprising a cyclonic separating apparatus for separating dirt from a dirt-bearing fluid flow, and a main body comprising a fluid inlet for receiving a fluid flow from the separating apparatus, a system for drawing the fluid flow into the rolling assembly, a plurality of rolling elements rotatable relative to the main body and which define with the main body a substantially spherical floor engaging rolling assembly, and a support, separate from the fluid inlet, connected to the main body for supporting the separating apparatus.

The support is preferably located on the front of the main body. The support preferably comprises a spigot locatable within a recess formed in a base member of the separating apparatus. When the separating apparatus is mounted on the support, the separating apparatus preferably has a longitudinal axis inclined at an acute angle to the vertical when the cleaning appliance moves over a substantially horizontal floor surface. This angle may be in the range from 30 to 70°. The main body may further comprise one or more additional supports for supporting the side surface of the separating apparatus.

The side surface of the separating apparatus is preferably cylindrical, and so these additional supports preferably have support surfaces which have a similar curvature to the side surface of the separating apparatus.

The appliance preferably comprises an inlet duct for conveying the dirt-bearing fluid flow to the separating apparatus. The duct preferably passes beneath the support, and preferably passes through a sleeve located between the support and the main body of the rolling assembly. The sleeve is preferably integral with the support and the main body. Alternatively, the support may be connected to a chassis connected to the main body of the rolling assembly.

Preferably, at least part of the duct is moveable relative to the support. The appliance preferably comprises a chassis connected to, and preferably integral with, the main body, and the pivoting part of the duct is preferably pivotably connected to the chassis. The appliance preferably comprises a plurality of floor engaging support members connected to the chassis for supporting the rolling assembly as it is maneuvered over a floor surface. Each support member preferably comprises a wheel or other rolling member, such as a caster or ball.

The duct preferably comprises an inlet section which is moveable relative to the support, and an outlet section for coupling the inlet section to the separating apparatus. The sleeve preferably extends about a joint between the inlet section and the outlet section of the duct. This joint may comprise one or more sealing members for maintaining a fluid tight seal between the sections of the duct as the inlet section pivots relative to the outlet section. The support may be configured to inhibit pivoting movement of the outlet section with the inlet section. For example, one of the support and the outlet section may comprise a detent which is locatable within a recess of the other of the support and the outlet section.

Each of the plurality of rolling elements is preferably in the form of a wheel rotatably connected to a respective side of the main body of the rolling assembly. Each of these rolling elements preferably has a curved, preferably dome-shaped, outer surface. Each of the plurality of rolling elements preferably has an outer surface of substantially spherical curvature. The rotational axes of the rolling elements may be inclined upwardly towards the main body with respect to a floor surface upon which the cleaning appliance is located so that the rims of the rolling elements engage the floor surface. The angle of the inclination of the rotational axes is preferably in the range from 4 to 15°, more preferably in the range from 5 to 10°. As a result of the inclination of the rotational axes of the rolling elements, part of the outer surface of the main body is exposed to enable components of the cleaning appliance, such as user-operable switches for activating the motor or a cable-rewind mechanism, to be located on the exposed part of the main body. In a preferred embodiment, one or more ports for exhausting the air flow from the cleaning appliance are located on the outer surface of the main body. The main body preferably comprises a filter for removing particulates from the fluid flow. The filter is preferably located downstream from the system for drawing the fluid flow into the rolling assembly, which is preferably in the form of a motor-driven fan unit.

The cleaning appliance preferably comprises an outlet duct extending from the separating apparatus to the rolling assembly for conveying the fluid flow to the rolling assembly. Preferably, the duct can be disengaged from the separating apparatus to allow the separating apparatus to be removed from the appliance. To facilitate the disengagement of the duct from the separating apparatus, the duct is preferably pivotably connected to the rolling assembly. The duct is preferably connected to the upper surface of the rolling assembly so that it can be moved between a raised position to allow the separating apparatus to be removed from, and subsequently relocated on, the appliance, and a lowered position, in which the duct engages the separating apparatus. In its lowered position, the duct is preferably configured to retain the separating apparatus on the appliance. The duct is preferably formed from a rigid material, preferably a plastics material, and may include a handle.

Although an embodiment of the invention is described in detail with reference to a vacuum cleaner, it will be appreciated that the invention can also be applied to other forms of cleaning appliance.

Features described above in connection with the first aspect of the invention are equally applicable to the second aspect of the invention, and vice versa.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. **1** is a front perspective view, from above, of a vacuum cleaner;

FIG. **2**(*a*) is a front perspective view, from above, of the vacuum cleaner, with a separating apparatus of the vacuum cleaner removed, FIG. **2**(*b*) is a side view of the same, and FIG. **2**(*c*) is a top view of the same;

FIG. **3** is a rear perspective view, from above, of the chassis base plate, wheel assemblies, inlet section of the inlet duct and biasing arrangements of the vacuum cleaner;

FIG. **4** is a top sectional view taken along line A-A in FIG. **2**(*b*);

FIG. **5**(*a*) is a front perspective view, from above, of the vacuum cleaner with the separating apparatus removed and the inlet section of the inlet duct pivoted relative to the chassis; and FIG. **5**(*b*) is a top view of the same;

FIG. **6**(*a*) is a side sectional view taken along line C-C in FIG. **2**(*c*), and FIG. **6**(*b*) is a magnified view of part of FIG. **6**(*a*);

FIG. **7**(*a*) is a top view of the separating apparatus, and FIG. **7**(*b*) is a sectional view taken along line D-D in FIG. **7**(*a*); and

FIG. **8** is a rear sectional view taken along line B-B in FIG. **2**(*c*).

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** illustrates an external view of a cleaning appliance in the form of a vacuum cleaner **10**. The vacuum cleaner **10** is of the cylinder, or canister, type. In overview, the vacuum cleaner **10** comprises separating apparatus **12** for separating dirt and dust from a fluid flow. The separating apparatus **12** is preferably in the form of cyclonic separating apparatus, and comprises an outer bin **14** having an outer wall **16** which is substantially cylindrical in shape. The lower end of the outer bin **14** is closed by curved base **18** which is pivotably attached to the outer wall **16**. A motor-driven fan unit for generating suction for drawing dirt laden fluid into the separating apparatus **12** is housed within a rolling assembly **20** located behind the separating apparatus **12**. The rolling assembly **20** comprises a main body **22** and two wheels **24**, **26** (see FIG. **2**(*a*)) rotatably connected to the main body **22** for engaging a floor surface. An inlet duct **28** extending beneath the separating apparatus **12** conveys dirt-bearing fluid into the separating apparatus **12**, and an outlet duct **30** conveys fluid exhausted from the separating apparatus **12** into the rolling assembly **20**. The inlet duct **28** is connected to a hose of a hose and wand assembly (not shown) which the user pulls to maneuver the vacuum cleaner **10** over the floor surface.

A chassis **32** is connected to the main body **22** of the rolling assembly **20**. In this example, the chassis **32** is integral with part of the main body **22** of the rolling assembly **20**. The chassis **32** is generally in the shape of an arrow head pointing forwardly from the rolling assembly **20**. The chassis **32** comprises side edges **34** which extend rearwardly and outwardly from the front tip **36** of the chassis **32**, shown in FIGS. **5**(*b*) and **6**(*a*). The front tip **36** of the chassis **32** is located on an axis A extending substantially perpendicular to a vertical plane passing through the center of the rolling assembly **20**. The direction in which the vacuum cleaner **10** moves over a floor surface during a cleaning operation extends along the axis A. The angling of the side edges **34** relative to the axis A can assist in maneuvering the vacuum cleaner **10** around corners, furniture or other items upstanding from the floor surface, as upon contact with such an item these side edges **34** tend to slide against the upstanding item to guide the rolling assembly **20** around the upstanding item. As illustrated in the figures, bumpers or pads **38** may be attached to the side edges **34**.

A pair of wheels **40** for engaging the floor surface is connected to the chassis **32**. The wheels **40** are located behind the side edges **34** of the chassis **32**, and in front of the wheels **24**, **26** of the rolling assembly **20**. As shown in FIG. **3**, each wheel **40** is mounted on a respective axle **42** fitted to the chassis **32**, for example by press fitting or overmolding, so that the wheel **40** rotates relative to the axle **42**, and thus relative to the chassis **32**. Each axle **42** is aligned along an axis which is substantially perpendicular to the axis A so that the wheels **40** rotate to move the vacuum cleaner **10** in a direction extending along the axis A.

The wheels **40** also provide support members for supporting the rolling assembly **20** as the vacuum cleaner **10** is maneuvered over a floor surface by restricting rotation of the rolling assembly **20** about the axis A. For increased support to the rolling assembly **20**, the distance between the points of contact of the wheels **40** with the floor surface is greater than that between the points of contact of the wheels **24**, **26** of the rolling assembly **20** with that floor surface.

As shown in FIG. **2**(*b*), the components of the vacuum cleaner **10** are arranged so that, when the vacuum cleaner **10** is located on a substantially horizontal floor surface F, the center of gravity C of the vacuum cleaner **10** is located within the rolling assembly **20**. The center of gravity C is located in a first vertical plane PL**1** which passes between a second vertical plane PL**2** containing the points of contact between the wheels **24**, **26** of the rolling assembly **20** and the floor surface, and a third vertical plane PL**3** containing the points of contact between the wheels **40** and the floor surface, preferably substantially mid-way between the two planes PL**2**, PL**3**. This can further enhance the stability of the vacuum cleaner **10** as it is maneuvered over the floor surface.

The location of the center of gravity C is indicated above for a situation in which the separating apparatus **12** is connected to the vacuum cleaner **10**, and the separating apparatus **12** is in an unloaded state, and with no hose and wand assembly connected to the vacuum cleaner **10**.

To reverse the direction in which the vacuum cleaner **10** is moving over a floor surface, the user may raise the wheels **40** of the chassis **32** from the floor surface, using the hose of the hose and wand assembly so that the vacuum cleaner **10** tilts backwards on to the wheels **24**, **26** of the rolling assembly **20**. Using the hose, the vacuum cleaner **10** may then be "spun" around the point of contact between the rolling assembly **20** and the floor surface until the vacuum cleaner **10** is facing in the required direction. The hose may then lowered to bring the wheels **40** back into contact with the floor surface, and the vacuum cleaner **10** pulled in the required direction.

To enable the vacuum cleaner **10** to be maneuvered smoothly around an object or the corner of a wall during a cleaning operation, part of the inlet duct **28** is connected to the chassis **32** for pivoting movement relative to the chassis **32**, and thus relative to the rolling assembly **20**. FIGS. **2**(*a*) to **2**(*c*) illustrate the vacuum cleaner **10** with the separating apparatus **12** to reveal the inlet duct **28**. The removal of the separating apparatus **12** from the vacuum cleaner **10** is described in more detail below. The inlet duct **28** comprises an inlet section **44** for receiving the dirt-bearing fluid flow from the hose and wand assembly, and an outlet section **46** for coupling the inlet section **44** to the separating apparatus **12** to convey the dirt-bearing fluid flow into the separating apparatus **12**. The inlet section **44** is pivotably connected to the chassis **32**, whereas the outlet section **46** is connected to the main body **22** of the rolling assembly **20** so that the inlet section **44** is pivotable relative to the outlet section **46**. Alternatively, the outlet section **46** may be connected to the chassis **32**.

With particular reference to FIGS. **3**, **4**, **6**(*a*) and **6**(*b*), in this example the inlet section **44** of the inlet duct **28** comprises a plurality of components. The inlet section **44** comprises a coupling **48** for electrical and/or physical connection to a wand and hose assembly (not shown) for conveying the duct-bearing fluid flow to the inlet duct **28**. The wand and hose assembly is connected to a cleaner head (not shown) comprising a suction opening through which a dirt-bearing fluid flow is drawn into the vacuum cleaner **10**. The coupling **48** is connected to one end of a cylindrical section **50** of the inlet duct **28**. Of course, the section **50** may have an alternative cross-sectional shape, such as an elliptical or polyhedral shape. The other end of the cylindrical section **50** is connected to a curved section **52** of the inlet duct **28**. In this example, the cylindrical section **50** is integral with the curved section **52**, but these two sections **50**, **52** of the inlet duct **28** may be integrally formed. The curved section **52** is shaped to change the direction in which the fluid flows through the inlet duct **28** by around 90°. The curved section **52** has a fluid outlet **54** which is concentric with, and located immediately below, a fluid inlet **56** of the outlet section **46** of the inlet duct **28**. One or more annular sealing members **58**, **60** are located between the fluid outlet **54** and the fluid inlet **56** to maintain an air tight seal and a relatively low frictional force therebetween during pivoting movement of the inlet section **44** relative to the outlet section **46**.

The inlet section **44** is mounted on a cylindrical spindle **62** extending upwardly from the upper surface of the chassis **32**. The curved section **52** comprises a cylindrical boss **64** depending downwardly therefrom and which is located over the spindle **62** so as to be substantially concentric with the spindle **62**. A plain bearing or sleeve **66** may be located between the spindle **62** and the boss **64** to minimize friction therebetween during rotation of the boss **64** about the spindle **62** and to ensure accurate alignment between the spindle **62** and the boss **64**. Alternatively, the spindle **62** may be formed from a low friction material. The longitudinal axis of the spindle **62** thus defines the pivot axis P about which the inlet section **44** pivots relative to the chassis **32** and the outlet section **46**. The pivot axis P passes through the center of the fluid outlet **54** of the inlet section **44** and the fluid inlet **56** of the outlet section **46**. The pivot axis P is substantially vertical when the vacuum cleaner **10** is located on a horizontal floor surface. As the curved section **52** is shaped with a 90° bend, the longitudinal axis of the cylindrical section **50** is substantially orthogonal to the pivot axis P and so during pivoting movement of the inlet section **44** the cylindrical section **50** sweeps orthogonally about the pivot axis P.

The pivoting movement of the inlet section **44** relative to the chassis **32** is guided by a pin or rib **68** depending from the cylindrical section **50**. The rib **68** is moveable within a curved groove or slot **70** which extends about the pivot axis P, and which is formed in a portion of the upper surface of the chassis **32** which is substantially orthogonal to the pivot axis P.

The inlet section **44** is pivotable about the pivot axis P by an angle of $\pm\alpha°$ from a central, rest position. The angle α is preferably in the range from 15 to 45°, and in this example is around 30°. The inlet section **44** is illustrated in its rest position in FIGS. **1** to **4**, **6**(*a*) and **6**(*b*). In this rest position, the inlet section **44** is aligned along the axis A, that is, with the longitudinal axis of the cylindrical section **50** of the inlet section **44** parallel to the axis A. FIGS. **5**(*a*) and **5**(*b*) illustrate the vacuum cleaner **10** with the inlet section **44** pivoted by around 30° in the angular direction R_1, indicated in FIG. **4**, from the rest position. The extent of the pivoting movement of the inlet section **44** away from the rest position is restricted by the abutment of the side of the inlet section **44** with one of a pair of raised walls **72** of the chassis **32**, as illustrated in FIG. **1**.

The inlet section **44** of the inlet duct **28** is biased towards a rest position. Consequently, when the inlet section **44** is pivoted away from the rest position during the maneuvering the vacuum cleaner **10** over a floor surface, for example while the vacuum cleaner **10** is being pulled around an object or piece of furniture, the inlet duct **44** will return automatically to its rest position when the vacuum cleaner **10** has moved away from the object.

The inlet section **44** is biased towards its rest position by a biasing system which engages the inlet section **44** to urge the inlet section **44** towards its rest position. With reference now to FIGS. **3** and **4**, in this example the biasing system comprises a plurality of biasing arrangements **74**, **76** located on opposite sides of the inlet section **44**. A first biasing arrangement **74** is arranged to urge the inlet section **44** towards the rest position when it moves in angular direction R1 away from the rest position, and a second biasing arrangement **76** is arranged to urge the inlet section **44** towards the rest position when it moves in angular direction R_2, opposite to R_1, away from the rest position.

The inlet section **44** comprises a return member for engaging the biasing arrangements **74**, **76** as the inlet section **44** is pivoted away from the rest position. In this example, the return member is in the form of an arm **78** connected to the curved section **52**, and generally on the opposite side of the curved section **52** to the cylindrical section **50**.

The biasing arrangements **74**, **76** are located beneath the chassis **32**. The vacuum cleaner **10** includes a chassis base plate **80** which is connected to the lower section of the chassis **32**, and the biasing arrangements **74**, **76** are located within a housing **82** located between the chassis **32** and the chassis base plate **80**. During assembly, the biasing arrangements **74**, **76** are located within the housing **82**, and the housing **82** is connected to the base plate **80**. The chassis **32** is then connected to the base plate **80**, for example by means of screws or other connectors **84** inserted through apertures in the base plate **80**. The inlet section **44** is then mounted on the chassis **32**. To engage the biasing arrangements **74**, **76**, the arm **78** of the inlet section **44** extends through a curved slot **86**, indicated in FIG. **6**(*a*), formed in the chassis **32** behind the spindle **62** to enter the housing **82**.

With particular reference to FIG. **4**, the housing **82** extends about the pivot axis P. When the inlet section **44** is in its rest position, the arm **78** is located centrally within the housing **82**, between the biasing arrangements **74**, **76**. Each biasing arrangement **74**, **76** is located within a respective compartment of the housing **82**, between which the arm **78** is located when in its rest position. Each biasing arrangement **74**, **76** comprises a resilient element, in this example in the form of a helical compression spring **88**, and a piston, in this example in the form of a circular disc **90**. The spring **88** urges the disc **90** against an annular seat located at one end of the compartment. The other end of the compartment is closed by a closure member **92** connected to the housing **82**.

When the inlet section **44** is pivoted about the pivot axis P in the direction R_1, for example, the arm **78** enters the compartment housing the biasing arrangement **74**. The biasing force of the spring **88** is selected to allow the arm **78** to move within the compartment towards the closure member **92**, against the biasing force of the spring **88**, without the user having to apply an excessive force to the inlet section **44** using the hose and wand assembly attached thereto. When the user relaxes the force applied to the inlet section **44**, for example when the vacuum cleaner **10** has moved beyond an obstacle on the floor surface, the biasing force of the spring **88** exceeds the force applied to the inlet section **44**. This causes the spring **88** to urge the disc **90** back towards its seat, thereby returning the arm **78** automatically to its rest position.

As mentioned above, the outlet section **46** of the inlet duct **28** provides a static coupling between the separating apparatus **12** and the inlet section **44** of the inlet duct **28**. The fluid inlet **56** of the outlet section **46** is mounted on, and supported by, the annular sealing members **58**, **60** of the inlet duct **28**. The outlet section **46** is removably connected to the main body **22** of the rolling assembly **20** to allow the outlet section **46** to be removed from the vacuum cleaner **10** by the user to allow any blockages within the outlet section **46** to be removed. The removal of the outlet section **46** from the vacuum cleaner **10** also facilitates the removal of blockages from within the inlet section **44** of the inlet duct **28**. As shown in FIG. **6**(*b*), the outlet section **46** comprises a manually operable, resilient catch **100** which extends upwardly from a rear surface of the outlet section **46**. The catch **100** engages a catch face **102** located on the main body **22** of the rolling assembly **20**, or alternatively on the chassis **32**, to retain the outlet section **46** on the main body **22**. To remove the outlet section **46**, the user pulls the catch **100** away from the catch face **102** and lifts the outlet section **46** away from the inlet section **44**.

The vacuum cleaner **10** comprises a support **104** for supporting the separating apparatus **12**. The support **104** is connected to, and in this example is integral with, part of the main body **22** of the rolling assembly **20**. The support **104** extends forwardly from the main body **22** so as to extend over the inlet section **44** of the inlet duct **28**. The main body **22**, and therefore the support **104**, is formed from a relatively rigid material, preferably a plastics material, so that, when the separating apparatus is mounted on the support **104**, the support **104** does not deform to such an extent as to engage the upper surface of the inlet section **44**, and thereby interfere with the pivoting movement of the inlet section **44** relative to the chassis **32**. The end of the support **104** which is remote from the main body **22** comprises a spigot **106** which extends upwardly therefrom for location within a recess (not shown) formed in the base **18** of the outer bin **14**. The location of the spigot **106** within the recess ensures correct angular alignment of the separating apparatus **12** relative to the support **104** when it is mounted on the support **104**, so that a fluid inlet **108** of the separating apparatus **12** is located over and against a fluid outlet **110** of the outlet section **46**. The outlet section **46** is provided with a flexible annular seal surrounding the fluid outlet **110** for forming an air tight seal against the periphery of the fluid inlet **108** of the separating apparatus **12**.

When the separating apparatus **12** is mounted on the support **104**, the longitudinal axis of the outer bin **14** is inclined to the pivot axis P, in this example by an angle in the range from 30 to 40°. The outer wall **16** of the outer bin **14** is supported by a pair of resilient supports **112** mounted on the main body **22** of the rolling assembly **20**.

To provide the vacuum cleaner **10** with a compact appearance, the main body **22** and the support **104** together define a sleeve **114** through which the inlet duct **28** extends. The longitudinal axis of the sleeve **114** is co-linear with the pivot axis P of the inlet section **44**. The inlet section **44** and the outlet section **46** of the inlet duct **28** are located on opposite sides of the sleeve **114**. The sleeve **114** thus surrounds the fluid outlet **54** of the inlet section **44**, the fluid inlet **56** of the outlet section **56**, and the annular sealing members **58**, **60**. The inner surface of the sleeve **114** comprises a recess **116** for receiving a detent **118** located on the outer surface of the outlet section **46** when the outlet section **46** is mounted on the main body **22**. The recess **116** has substantially the same profile as the detent **118** to inhibit rotation of the outlet section **46** relative to the sleeve **114**, and therefore relative to the separating apparatus **12** and the main body **22**, as the inlet section **44** pivots about the pivot axis P.

The separating apparatus **12** is illustrated in FIGS. **7**(*a*) and **7**(*b*). The specific overall shape of the separating apparatus **12** can be varied according to the size and type of vacuum cleaner in which the separating apparatus **12** is to be used. For example, the overall length of the separating apparatus **12** can be increased or decreased with respect to the diameter of the apparatus, or the shape of the base **18** can be altered.

As mentioned above, the separating apparatus **12** comprises an outer bin **14** which has an outer wall **16** which is substantially cylindrical in shape. The lower end of the outer bin **14** is closed by a base **18** which is pivotably attached to the outer wall **16** by means of a pivot **120** and held in a closed position by a catch (not shown) which engages a groove located on the outer wall **16**. In the closed position, the base **18** is sealed against the lower end of the outer wall **16**. The catch is resiliently deformable so that, in the event that downward pressure is applied to the uppermost portion of the catch, the catch will move away from the groove and become disengaged therefrom. In this event, the base **18** will drop away from the outer wall **16**.

With particular reference to FIG. **7**(*b*), the separating apparatus **12** further comprises a dust collector **122** located within the outer bin **14**. The dust collector **122** has a generally cylindrical outer wall **124**, and a generally cylindrical inner wall **126** connected to the outer wall **124** at the upper end of the dust collector **122**, and a base **128** which closes the lower end of the inner wall **126**. The outer wall **124** of the dust collector **122** is located radially inwardly of the outer wall **16** and spaced therefrom so as to form an annular chamber **130** therebetween. The outer wall **124** of the dust collector **122** meets the base **18** (when the base **18** is in the closed position) and is sealed against an annular sealing member **132** carried by the base **18**. The fluid inlet **108** is arranged tangentially to the outer bin **14** (as shown in FIG. **6**(*a*)) so as to ensure that incoming dirty fluid is forced to follow a helical path around the annular chamber **124**.

A fluid outlet from the annular chamber **130** is provided in the form of a perforated shroud. The shroud has an upper section **134** formed in a frusto-conical shape, a cylindrical section **136** and a skirt **138** depending therefrom. A large number of apertures are formed in the cylindrical section **136**. The skirt **138** tapers outwardly from the cylindrical section **136** in a direction towards the outer wall **16**.

The upper section **134** of the shroud is connected to a cyclone pack **140**. The cyclone pack **140** is mounted on the upper end of the dust collector **122**, and comprises a circumferential flange **142** for engaging the upper end of the outer bin **14**. The cyclone pack **140** carries an annular seal **144** for sealing against the outer wall **16** adjacent the upper end of the outer bin **14**.

The cyclone pack **140** comprises an annular array of cyclones **146**. The cyclones **146** are arranged in parallel. In the preferred embodiment there are twelve cyclones **146** for this bin diameter arranged in a ring which is centered on a longitudinal axis of the outer bin **14**. Each cyclone **146** has an axis which is inclined downwardly and towards the longitudinal axis. The twelve cyclones **146** can be considered to form a second cyclonic separating unit, with the annular chamber **130** forming the first cyclonic separating unit. In the second cyclonic separating unit, each cyclone **146** has a smaller diameter than the annular chamber **124** and so the second cyclonic separating unit is capable of separating finer dirt and dust particles than the first cyclonic separating unit. It also has the added advantage of being challenged with a fluid flow which has already been cleaned by the first cyclonic separating unit and so the quantity and average size of entrained particles is smaller than would otherwise have been the case. The separation efficiency of the second cyclonic separating unit is higher than that of the first cyclonic separating unit.

Each cyclone **146** is identical to the other cyclones **146**, and comprises a cylindrical upper portion having a tangential inlet **148** and a tapering portion depending from the upper portion. The tapering portion of each cyclone **146** is frusto-conical in Shape and terminates in a cone opening **150**. Each tapering portion protrudes through an aperture formed in the upper end of the dust collector **122** so that the cone opening **150** is located in a chamber **152** located between the outer wall **124** and the inner wall **126** of the dust collector **122**.

The inner wall **126** and the base **128** of the dust collector **122** form a lower section of a filter housing **154**. An upper section of the filter housing **154** is provided by a generally annular filter housing member **156** mounted on the upper end of the dust collector **122**, and which forms a generally continuous inner wall of the filter housing **154** with the inner wall **126** of the dust collector **122**. The cyclone pack **140** surrounds the filter housing member **156** and defines with the filter housing member **156** a plenum chamber **158** for conveying fluid which has passed through the apertures in the shroud to the inlets **148** of the cyclones **146**.

The open upper ends of the cyclones **146** are closed by an annular exhaust manifold. The exhaust manifold comprises an upper section **160** and a lower section **162**. An apertured sealing member **163** may be provided between the cyclone pack **140** and the lower section **162** of the exhaust manifold. The lower section **162** of the exhaust manifold comprises a vortex finder **164** to allow fluid to exit the cyclone **146**. Each vortex finder **164** communicates with a manifold finger **166** defined between the upper and lower sections **160**, **162** of the exhaust manifold. Each manifold finger **166** is a generally inverted U-shape and extends from the upper end of a respective cyclone **146** to a generally cylindrical exhaust manifold wall **168** formed in the upper section **160** of the exhaust manifold. The wall **168** comprises a plurality of apertures **170** each for receiving fluid from a respective one of the manifold fingers **166**. The wall **168** extends about a bore which is generally co-axial with the outer wall **16**.

The apertures **170** convey fluid into the filter housing **154**. A filter assembly **180** is located within the filter housing **154**. The filter assembly **180** is inserted into the filter housing **154** through the bore of the upper section **162** of the exhaust manifold. The filter assembly **180** comprises a body **182** and a filter **184** mounted on the filter body **182**. The filter body **182** is preferably a single-piece item, preferably molded from plastics material, but alternatively the filter body **182** may formed from a plurality of components connected together. The filter body **182** is generally tubular in shape, and comprises an annular body **186**, a set of radially extending elongate spokes **188** connected to the inner surface of the body **186** and depending therefrom. A set of elongate fins **190** is connected between the spokes **188** so that each fin **190** is located between adjacent spokes **188**. The fins **190** are connected to the spokes **188** by connectors **192**. The spokes **188** and the fins **190** together provide a support for supporting the filter **184**.

The filter **184** is in the form of a sock filter which extends about the spokes **188** and the fins **190** of the filter body **182**. The upper end of the filter **184** comprises a collar **194**, which is retained within an annular groove formed in the filter body **182**. The lower end of the filter **184** comprises a base or end cap **196** for closing the lower end of the filter **184** for ease of insertion of the filter assembly **180** into the filter housing **154**.

The filter **184** further comprises a plurality of tubular filter members of varying levels of filtration for removing dust and other particulates from the fluid flow passing through the filter housing **154**. The filter member having the finest level of filtration is preferably has the largest surface area. Each filter member of the filter assembly **180** is manufactured with a rectangular or tapering shape. The filter members are then joined and secured together along their longest edge by stitching, gluing or other suitable technique so as to form a tubular length of filter material having a substantially open cylindrical shape. An upper end of each cylindrical filter member is then attached to the collar **194**, while a lower end of each filter member is attached to the end cap **196**, for example by overmolding the material of the collar **194** and the end cap **196** during manufacture of the filter assembly **180**. Alternative manufacturing techniques for attaching the filter members include gluing, and spin-casting polyurethane around the upper and lower ends of the filter members. In this way the filter members are encapsulated by polyurethane during the manufacturing process to produce a sealed arrangement which is capable of withstanding manipulation and handling by a user.

The filter body **182** comprises an annular sealing member **198** for engaging the air inlet **200** of the outlet duct **30**. With reference to FIGS. **1** and **2**(*a*), in this example the air inlet **200** of the outlet duct **30** is generally dome-shaped, and enters the filter assembly **180** through the open upper end **202** of the filter body **182** to engage the sealing member **198** and form an air-tight seal therewith. The sealing member **198** may be overmolded with the filter body **182** during assembly, or otherwise attached to the filter body **182**. Alternatively, the sealing member **198** may be integral with the filter body **182**.

The outlet duct **30** is generally in the form of a curved arm extending between the separating apparatus **12** and the rolling assembly **20**. The outlet duct **30** is moveable relative to the separating apparatus **12** to allow the separating apparatus **12** to be removed from the vacuum cleaner **10**, and to allow the filter assembly **180** to be removed from the filter housing **154** of the separating apparatus **12**. The end of the tube outlet duct **30** which is remote from the air inlet **200** of the outlet duct **30** is pivotably connected to the main body **22** of the rolling assembly **20** to enable the outlet duct **30** to be moved between a lowered position in which the outlet duct **30** is in fluid communication with the separating apparatus **12**, and a raised position which allows the separating apparatus **12** to be removed from the vacuum cleaner **10**.

The outlet duct **30** is biased towards the raised position by a resilient member (not shown) located in the main body **22**. The main body **22** comprises a biased catch **204** for retaining the outlet duct **30** in the lowered position against the force of the resilient member, and a catch release button **206**. The outlet duct **30** comprises a handle **208** to allow the vacuum cleaner **10** to be carried by the user when the outlet duct **30** is retained in its lowered position. Alternatively, the outlet duct **30** may be used to carry the vacuum cleaner **10**. The catch **204** is arranged to co-operate with a finger **210** connected to outlet duct **30** to retain the outlet duct in its lowered position. Depression of the catch release button **206** causes the catch **204** to move away from the finger **210**, against the biasing force applied to the catch **204**, allowing the resilient member to move the outlet duct **30** to its raised position.

The rolling assembly **20** will now be described with reference to FIGS. **6**(*a*) and **8**. The rolling assembly **20** comprises a main body **22** and two curved wheels **24**, **26** rotatably connected to the main body **22** for engaging a floor surface. In this embodiment the main body **22** and the wheels **24**, **26** define a substantially spherical rolling assembly **20**. In this example, the main body **20** comprises an upper section **212** and a lower section **214** connected to the upper section **212**. The support **106** is integral with the upper section **212**, whereas the chassis **32** is integral with the lower section **214**. The wheel **24** is mounted on an axle **216** connected to the lower section **214** of the body **22**, whereas the wheel **26** is mounted on an axle **218** connected to the upper section **212** of the body **22**. The axles **216**, **218** are arranged so that the rotational axes of the wheels **24**, **26** are inclined upwardly towards the main body **22** with respect to a floor surface upon which the vacuum cleaner **10** is located so that the rims of the wheels **24**, **26** engage the floor surface. The angle of the inclination of the rotational axes of the wheels **24**, **26** is preferably in the range from 4 to 15°, more preferably in the range from 5 to 10° to minimize point contact with a floor surface.

Each of the wheels **24**, **26** of the rolling assembly **20** is generally dome-shaped. Each wheel **24**, **26** comprises an outer wheel member **220** and an inner wheel member **222** connected to the outer member **220** about the periphery thereof. The outer wheel member **220** and the inner wheel member **222** are preferably connected together using a spin welding technique. A plurality of annular connections is preferably made between the wheel members **220**, **222**. In this example, the wheel members **220**, **222** are joined together at three different positions P_1, P_2 and P_3, each of which is illustrated in FIG. **8**. Position P_1 is located at or towards the outer rims of the wheel members **220**, **222**, position P_3 is located at or towards the center of the wheel members **220**, **222**, and position P_2 is located generally midway between positions P_1 and P_3. The inner surface of the outer wheel member **220** and the outer surface of the inner wheel member **222** comprise interengaging features located at each of these positions. For example, one of the wheel members **220**, **222** may comprises a series of circular grooves each for received a respective raised circular bands formed on the other wheel member **220**, **222**

The wheel members **220**, **222** are formed from a relatively stiff material, preferably from a plastics material. For example, each of the wheels members **220**, **222** is preferably formed from a glass-filled polypropylene, preferably a 30% glass-filled polypropylene. Alternatively, the wheels members **220**, **222** may be formed from different plastics material. For example, the outer wheel member **220** may be formed from a 20% glass-filled polypropylene.

The inner wheel member **222** is shaped so as to maintain the outer wheel member **220** in a state of tension. This can make the outer surface of the wheels **24**, **26** relatively stiff, thereby making the wheels **24**, **26** less prone to deformation, for example due to impact with objects during a cleaning process.

The inner wheel member **222** comprises an annular bearing arrangement **224** for rotatably supporting the wheel **24**, **26** on its axle **216**, **218**. During assembly, the wheels **24**, **26** are located over their respective axles **216**, **218**, and a fastener **226** is connected over the bearing arrangement **224** to retain the wheel **24**, **26** on its axle **216**, **218**.

The rolling assembly **20** houses a motor-driven fan unit **228**, a cable rewind assembly **230** for retracting and storing within the main body **22** a portion of an electrical cable (not shown) terminating in a plug **232** providing electrical power to, inter alia, the motor of the fan unit **228**, and at least one filter assembly **234**. The fan unit **228** comprises a motor, and an impeller driven by the motor to drawn the dirt-bearing fluid flow into and through the vacuum cleaner **10**. The fan unit **228** is housed in a motor bucket **236**. The motor bucket **236** is connected to the lower section **214** of the main body **22** so that the fan unit **228** does not rotate as the vacuum cleaner **10** is maneuvered over a floor surface. In this example, the filter assembly **234** is located downstream of the fan unit **228**. The filter assembly **234** is cuff shaped and located around a part of the motor bucket **236**. A plurality of perforations is formed in a portion of the motor bucket **236** which is surrounded by the filter assembly **234** to allow air to pass from the motor bucker **236** to the filter assembly **234**.

The filter assembly **234** may be periodically removed from the rolling assembly **20** to allow the filter assembly **234** to be cleaned. The filter assembly **234** is accessed by removing the wheel **26** of the rolling assembly **20**. This wheel **26** may be removed, for example, by the user first removing the fastener **226**, and then pulling the wheel **26** from the axle **218**. The filter assembly **234** may then be removed from the rolling assembly **20** by depressing a catch connecting the filter assembly **234** to the motor bucket **236**, and pulling the filter assembly **234** from the rolling assembly **20**.

The main body **22** of the rolling assembly **20** further comprises a motor inlet duct **238** for conveying a fluid flow received from the outlet duct **30** to the motor bucket **236**. The motor inlet duct **238** is connected to the upper section **212** of the body **22** of the rolling assembly **20**, and has a fluid inlet **240** and a fluid outlet **242**. The cable rewind assembly **230** is mounted on the side of the motor inlet duct **238** which is opposite to the fluid outlet **242**. An annular seal **244** may be provided between the motor bucket **236** and the motor inlet duct **238**. The fan unit **228** comprises a series of exhaust ducts **246** located around the outer circumference of the fan unit **228**. In the preferred embodiment a plurality of exhaust apertures **246** are arranged around the fan unit **228** and provide communication between the fan unit **228** and the motor bucket **236**.

The main body **22** further comprises an air exhaust port for exhausting cleaned air from the vacuum cleaner **10**. The exhaust port is formed towards the rear of the main body **22**. In the preferred embodiment the exhaust port comprises a number of orifices **248** located in a lower section **214** of the main body **22**, and which are located so as to present minimum environmental turbulence outside of the vacuum cleaner **10**.

A first user-operable switch **250** is provided on the main body and is arranged so that, when it is depressed, the fan unit **228** is energized. The fan unit **228** may also be de-energized by depressing this first switch **250**. A second user-operable switch **252** is provided adjacent the first switch **250**. The second switch **252** enables a user to activate the cable rewind assembly **230**. Circuitry **254** for driving the fan unit **228**, cable rewind assembly **230** and other auxiliary components of the vacuum cleaner **10** is also housed within the rolling assembly **20**.

In use, the fan unit **228** is activated by the user pressing the switch **250**, and a dirt-bearing fluid flow is drawn into the vacuum cleaner **10** through the suction opening in the cleaner head. The dirt-bearing air passes through the hose and wand assembly, and enters the inlet duct **28**. The dirt-bearing air passes through the inlet duct **28** and enters the dirty air inlet **108** of the separating apparatus **12**. Due to the tangential arrangement of the dirty air inlet **108**, the fluid flow follows a helical path relative to the outer wall **16**. Larger dirt and dust particles are deposited by cyclonic action in the annular chamber **130** and collected therein.

The partially-cleaned fluid flow exits the annular chamber **130** via the apertures in the shroud and enters the plenum chamber **158**. From there, the fluid flow enters the twelve cyclones **146**, wherein further cyclonic separation removes some of the dirt and dust still entrained within the fluid flow. This dirt and dust is deposited in the dust collector **122** while the cleaned air exits the cyclones **146** via the vortex finders **164** and enters the manifold fingers **166**. The fluid flow then passes into the filter housing **154** through the apertures **170**. Within the filter housing **154**, the air flow flows through the filter **184** of the filter assembly **180**. The support provided by the spokes **188** and fins **190** of the filter body **182** prevents the filter **184** from collapsing as the air flow passes through the filter **184**. The air flow subsequently passes axially through the filter body **182** to be exhausted through the air outlet **202** of the filter assembly **180** and into the dome-shaped air inlet **200** of the outlet duct **30**.

The air flow passes through the outlet duct **30**, and enters the main body **22** of the rolling assembly **20** through the fluid inlet **240** of the motor inlet duct **238**. The motor inlet duct **238** guides the fluid flow into the fan unit **228**. The fluid flow is subsequently exhausted through the exhaust apertures **246** in the side of the fan unit **228** and into the motor bucket **236**. The fluid flow leaves the motor bucket **236** through the perforations and passes through the filter assembly **234**. Finally the fluid flow follows the curvature of the main body **22** to the orifices **248** in the main body **22**, from which the cleaned fluid flow is ejected from the vacuum cleaner **10**.

Through use, the filter assembly **180** can become clogged, causing a reduction in the filtration efficiency, and so the filter assembly **180** will require periodic cleaning or replacement. In the preferred embodiment the filter assembly **180** is capable of being cleaned by washing. The filter assembly **180** can be accessed by the user for cleaning when the outlet duct **30** is in its raised position. The user removes the filter assembly **180** from the separating apparatus **12** by gripping one of the spokes **188** of the filter body **182**, and pulling the filter assembly **180** from the filter housing **154**. The filter assembly **180** can be washed by rinsing under a household tap and allowed to dry. The filter assembly **180** is then re-inserted into the filter housing **154** of the separating apparatus **12**, the outlet duct **30** is moved to its lowered position and use of the vacuum cleaner **10** can continue.

When the outlet duct **30** is in its raised position, the separating apparatus **12** may be removed from the vacuum cleaner **10** for emptying and cleaning. The separating apparatus **12** comprises a handle **250** for facilitating the removal of the separating apparatus **12** from the vacuum cleaner **10**. The handle **250** is connected to the upper section **160** of the exhaust manifold **122**, for example by a screw or a snap-fit connection. To empty the separating apparatus **12**, the user depresses a button **252** located on the upper section **160** of the exhaust manifold for actuating a mechanism for applying a downward pressure to the uppermost portion of the catch on the base **18**. This causes the catch to deform and disengage from the groove located on the outer wall **16** of the outer bin **14**. This enables the base **18** to move away from the outer wall **16** to allow dirt and dust that has been collected in the separating apparatus **12** to be emptied into a dustbin or other receptacle. The mechanism for applying the force to the catch preferably comprises a series of push rods which are moved towards the catch in response to the depression of the button

252. The arrangement of push rods allows the outer bin **14** to be separated from the cyclone pack **140**.

The invention claimed is:

1. A cleaning appliance of the canister type comprising:

a cyclonic separating apparatus for separating dirt from a dirt-bearing fluid flow,

a main body comprising a fluid inlet for receiving a fluid flow from the separating apparatus and a system for drawing the fluid flow into the main body, and

a plurality of rolling elements rotatable relative to the main body and which define with the main body a substantially spherical floor engaging rolling assembly,

wherein the separating apparatus is mounted on the main body, the main body comprises a support for supporting the separating apparatus, and the support is fixed relative to the main body.

2. The cleaning appliance of claim **1**, wherein the support is integral with the main body.

3. The cleaning appliance of claim **1**, wherein the support is located on the front of the main body.

4. The cleaning appliance of claim **1**, wherein the support comprises a spigot locatable within a recess formed in a base member of the separating apparatus.

5. The cleaning appliance of claim **1**, comprising a duct for conveying the dirt-bearing fluid flow to the separating apparatus.

6. The cleaning appliance of claim **5**, wherein the duct extends beneath the support.

7. The cleaning appliance of claim **5**, wherein the duct passes through a sleeve located between the support and the main body.

8. The cleaning appliance of claim **5**, wherein at least part of the duct is moveable relative to the support.

9. The cleaning appliance of claim **8**, comprising a chassis connected to the main body, and wherein said at least part of the duct is pivotably connected to the chassis.

10. The cleaning appliance of claim **9**, comprising a plurality of floor engaging support members connected to the chassis for supporting the rolling assembly as it is maneuvered over a floor surface.

11. The cleaning appliance of claim **10**, wherein each support member comprises a wheel.

12. The cleaning appliance of claim **9**, wherein the duct comprises an inlet section which is moveable relative to the support, and an outlet section for coupling the inlet section to the separating apparatus.

13. The cleaning appliance of claim **1**, wherein the rotational axes of the rolling elements are inclined upwardly towards the main body with respect to a floor surface upon which the cleaning appliance is located.

14. The cleaning appliance of claim **1**, wherein each of the plurality of rolling elements has an outer surface of substantially spherical curvature.

15. The cleaning appliance of claim **1**, wherein the main body comprises a filter for removing particulates from the fluid flow.

16. The cleaning appliance of claim **1**, comprising an outlet duct extending from the separating apparatus to the rolling assembly for conveying the fluid flow to the rolling assembly.

17. The cleaning appliance of claim **16**, wherein the outlet duct is detachable from the separating apparatus to allow the separating apparatus to be removed from the main body.

18. The cleaning appliance of claim **16**, wherein the outlet duct comprises a handle.

19. The cleaning appliance of claim **16**, wherein the outlet duct is pivotably connected to the rolling assembly.

20. The cleaning appliance of claim **1**, wherein the separating apparatus has a longitudinal axis inclined at an acute angle to the vertical when the cleaning appliance moves over a substantially horizontal floor surface.

21. The cleaning appliance of claim **20**, wherein the angle is in the range from 30 to 70°.

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